

Remarks/Arguments

The Applicant respectfully request further examination and reconsideration in view of the above amendments and arguments set forth fully below. Claims 1, 8-27, 29-33, 35-128 were previously pending in the present application. Claims 9, 11, 15-18, 20-27, 33, 35-37, 39, 42, 43, 45-127 are withdrawn from consideration. By the above amendments, Claim 1 is amended and new Claim 129-131 are added. Accordingly, Claims 1, 8, 10, 12-14, 16, 17, 19, 29-32, 38, 40, 41, 44 and 128-131 are currently pending in this application.

Support for Claim Amendments

The Applicant respectfully submits that the amendments to Claims 1 and 129-131 are supported by the original disclosure of the present application. Specifically, support is found in Figure 21. Independent Claim 1 includes the limitation that *the at least one inlet port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough*. As illustrated in Figure 21, fluid enters the manifold layer via the inlet port and flows along the inlet channel to fingers which branch out in a plurality of directions (e.g., X and/or Y directions) from the inlet channel. The bottom surface of the manifold layer abuts against the top surface of the intermediate layer. The fingers has a plurality of apertures that allows fluid to flow from the manifold layer to the intermediate layer. The intermediate layer has a plurality of conduits that directs the fluid entering from the manifold layer to designated interface hot spot regions. Therefore, the Applicant respectfully submits that the amendments to Claims 1 and 129-131 do not introduce any new matter.

Cited References

A. U.S. Patent No. 5,388,635 to Gruber et al. (hereafter “Gruber”)

Gruber teaches a cooling hat that has a first tier 216 which includes a supply port and a return port with associated duct segments, a second tier 218 which includes vias and supply channels and return channels, and a third tier 220 which includes a coldsheet with fins and grooves. [Gruber, col. 11, lines 40-44] The supply ports, supply ducts, supply channels, supply capillaries, grooves, return capillaries, return channels, return ducts, return ports are each a separate tier. [Gruber, col. 10, lines 3-6] *Gruber does not teach that the at least one inlet port*

directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough. Instead, Gruber teaches that a plurality of supply ducts 30 are coupled to the supply port 28. As such, coolant flows through the cooling hat by first entering the supply port 28. The coolant then divides into the plurality of supply ducts segments 30. [Gruber, col. 8, lines 56-60] Each of the plurality of supply ducts is oriented in the same direction. [Gruber, col. 5, lines 41-44] As illustrated in Figure 4, the coolant then flows through supply channel vias 30 to each supply channel 32. [Gruber, col. 9, lines 43-45] Gruber teaches that fluid flow is highly parallel. [Gruber, Abstract] Further, *Gruber does not teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger.* Instead, as illustrated in the figures of Gruber, the inlet port is positioned perpendicular with respect to a conducting portion.

B. U.S. Patent No. 5,761,037 to Anderson et al. (hereafter “Anderson”)

Anderson teaches an evaporator for cooling components. [Anderson, Abstract] The evaporator includes a housing for containment of the working fluid. The housing has a surface 104 which is placed in thermal contact with the object body, chip or module to be cooled. The evaporator housing has a heated surface 104 and cap 105. A wicking layer 103 is immediately adjacent to the surface 104. [Anderson, column 3, lines 45-59] The evaporator includes wick member 102 and optional wicking spreader 101. [Anderson, column 3, line 65 through column 4, line 3] *Anderson does not teach that the at least one inlet port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough.* Instead, as illustrated in the figures of Anderson, fluid enters the inlet port and is spread to a plurality of parallel channels in the wick member. Further, *Anderson does not teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger.* Instead, as illustrated in Figure 2 of Anderson, the inlet port is positioned perpendicular with respect to a conducting portion.

C. U.S. Patent No. 5,983,997 to Hou (hereafter "Hou")

Hou teaches a system for cooling electronic components including a cold plate. The cold plate has a channel through which a fluid coolant is transported, a plurality of bosses each receiving a heat generating component, and a plurality of fin structures. [Hou, Abstract] *Hou does not teach that the at least one inlet port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough.* Instead, as illustrated in Figure 2, the fluid channel of Hou extends between the fluid inlet and the fluid outlet; the fluid travels through the channel and into the fin structures, which directs the fluid around the perimeter of the bosses to cool electronic components seated on the bosses. Further, *Hou does not teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger.* Since the inlet of Hou is not at a perimeter of the cold plate, fluid enters perpendicularly to the cold plate, as illustrated in Figure 2. As such, Hou implicitly teaches that the inlet is positioned perpendicular with respect to the conducting portions.

D. U.S. Patent No. 5,239,200 to Messina et al. (hereafter "Messina")

Messina teaches an apparatus for cooling an array of integrated circuit chips mounted on a substrate. The substrate has a cooling plate that has a plurality of integral, substantially parallel, closed-end channels. [Messina, Abstract] *Messina does not teach that the at least one inlet port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough.* Further, *Messina does not teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger.* Instead, as illustrated in the figures of Messina, the inlet port is positioned perpendicular with respect to a conducting portion.

E. Jiang et al. article "Thermal-Hydraulic performance of small scale micro-channel and porous-media heat exchangers" (hereafter "Jiang")

In Jiang, the flow and heat transfer performances of a micro-channel heat-exchanger and a micro-porous heat-exchanger are theoretically and experimentally investigated and evaluated. The experimental apparatus consisted of water tanks, pumps, a test section, regulator valves,

accurate manometers, instrumentation to measure temperatures, an electric heater system and filters. The test section contained either a micro-channel heat-exchanger or a micro-porous heat-exchanger. [Jiang, page 1041] The heat-exchangers are fabricated from stacked cooper plates. To manufacture the micro-channel heat-exchanger, the stack is heated until soldering tin is melted. To manufacture the micro-porous heat-exchanger, the stack is sintered together with small copper particles. The heat-exchangers are packaged and sealed. [Jiang, page 1041-1042] *Jiang does not teach that the at least one inlet port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough.* Further, *Jiang does not teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger.*

F. U.S. Patent No. 4,896,719 to O'Neill (hereafter "O'Neill")

O'Neill teaches a plenum in combination with a heat exchange panel and a panel structure having a large number of closely spaced orifices of equal size. [O'Neill, Abstract] A conduit provides fluid to the panel structure. [O'Neill, column 2, lines 8-10] The fluid is forced into the heat exchanging panel through orifices and out of the heat exchanging panel through orifices. [O'Neill, col. 3, lines 13-18] *O'Neill does not teach that the at least one inlet port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough.* Instead, O'Neill teaches that a heat exchange medium directed into the plenum through conduit 16 travels up through orifices 18 to panel 14, then returns from 14 to exhaust down through the plenum via tubes 23. [O'Neill, col. 2, lines 61-67] Further, *O'Neill does not teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger.* Instead, as illustrated in the figures of O'Neill, the inlet port is positioned perpendicular with respect to a conducting portion

G. U.S. Patent No. 6,680,044 to Tonkovich (hereafter "Tonkovich")

Tonkovich teaches chemical reactors and reaction chambers and methods for conducting chemical reactions having gas phase reactants. [Tonkovich, Abstract] Tonkovich does not disclose a heat exchanging system. As such, *Tonkovich does not teach that the at least one inlet*

port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough. Further, Tonkovich does not teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger.

Rejections under 35 U.S.C. §103

Within the Office Action, Claims 1, 8, 10, 12-14, 17, 19, 32, 38, 40 and 128 are rejected under 35 U.S.C. §103(a) as obvious over the combined teachings of Gruber and Anderson. The Applicant respectfully traverses these rejections. As discussed above, neither Gruber, Anderson nor their combination teach that the at least one inlet port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough. Since independent Claim 1 includes these limitations not taught by Gruber, Anderson and their combination, independent Claim 1 is an allowable base claim. Claims 8, 10, 12-14, 17, 19, 32, 38, 40 and 128 are dependent on the independent Claim 1. Since independent Claim 1 is an allowable base claim, Claims 8, 10, 12-14, 17, 19, 32, 38, 40 and 128 are all also allowable as being dependent upon an allowable base claim.

Further, in regards to Claim 8, neither Gruber, Anderson nor their combination teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger. As such, Claim 8 is also allowable for this reason.

Within the Office Action, Claims 1, 8, 10, 12-14, 17, 19, 32, 38, 40 and 128 are rejected under 35 U.S.C. §103(a) as obvious over the combined teachings of Gruber/Anderson and further in view of either Hou or Messina. The Applicant respectfully traverses these rejections. As discussed above, neither Gruber, Anderson, Hou, nor their combination teach that the at least one inlet port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough. Also as discussed above, neither Gruber, Anderson, Messina, nor their combination teach that the at least one inlet port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and

from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough. Since independent Claim 1 includes these limitations not taught by Gruber; Anderson; Hou; the combination of Gruber, Anderson and Hou; Messina; and the combination of Gruber, Anderson and Messina, independent Claim 1 is an allowable base claim. Claims 8, 10, 12-14, 17, 19, 32, 38, 40 and 128 are dependent on the independent Claim 1. Since independent Claim 1 is an allowable base claim, Claims 8, 10, 12, 13, 14, 17, 19, 32, 38, 40 and 128 are all also allowable as being dependent upon an allowable base claim.

Further, in regards to Claim 8, neither Gruber, Anderson, Hou nor their combination teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger. In addition, neither Gruber, Anderson, Messina nor their combination teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger. As such, Claim 8 is also allowable for these reasons.

Within the Office Action, Claim 16 is rejected under 35 U.S.C. §103(a) as unpatentable over Gruber/Anderson alone or in view of Hou or Messina as applied to Claim 1, and further in view of U.S. Patent No. 4,758,926 to Herrell (hereafter “Herrell”). The Applicant respectfully traverses this rejection. Claim 16 is dependent on the independent Claim 1. Since independent Claim 1 is an allowable base claim, Claim 16 is also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claims 29-32 are rejected under 35 U.S.C. §103(a) as unpatentable over Gruber/Anderson alone or in view of Hou or Messina as applied to Claim 1, and further in view of Tonkovich. The Applicant respectfully traverses these rejections. Claims 29-32 are dependent on the independent Claim 1. Since independent Claim 1 is an allowable base claim, Claims 29-32 are all also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claims 1, 8, 10, 12-14, 16, 17, 19, 29-32, 38, 40 and 128 are rejected under 35 U.S.C. §103(a) as obvious over the combined teachings of Gruber in view of the Jiang. The Applicant respectfully traverses these rejections. As discussed above, neither Gruber, Jiang nor their combination teach that the at least one inlet port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions

from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough. Since independent Claim 1 includes these limitations not taught by Gruber, Jiang and their combination, independent Claim 1 is an allowable base claim. Claims 8, 10, 12-14, 16, 17, 19, 29-32, 38, 40 and 128 are dependent on the independent Claim 1. Since independent Claim 1 is an allowable base claim, Claims 8, 10, 12-14, 16, 17, 19, 29-32, 38, 40 and 128 are all also allowable as being dependent upon an allowable base claim.

Further, in regards to Claim 8, neither Gruber, Jiang nor their combination teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger. As such, Claim 8 is also allowable for this reason.

Within the Office Action, Claims 1, 8, 10, 12-14, 16, 17, 19, 29, 30-32, 38, 40 and 128 are rejected under 35 U.S.C. §103(a) as being unpatentable over Gruber in view of O'Neill and Tonkovich. The Applicant respectfully traverses these rejections. As discussed above, neither Gruber, O'Neill, Tonkovich nor their combination teach that the at least one inlet port directs fluid from an inlet channel coupled to the at least one port to fingers which branch out in a plurality of directions from the inlet channel and from the fingers to the heat exchanging layer via an intermediate layer with a plurality of conduits which extend therethrough. Since independent Claim 1 includes these limitations not taught by Gruber, O'Neill, Tonkovich and their combination, independent Claim 1 is an allowable base claim. Claims 8, 10, 12-14, 16, 17, 19, 29, 30-32, 38, 40 and 128 are dependent on the independent Claim 1. Since independent Claim 1 is an allowable base claim, Claims 8, 10, 12-14, 16, 17, 19, 29, 30-32, 38, 40 and 128 are all also allowable as being dependent upon an allowable base claim.

Further, in regards to Claim 8, neither Gruber, O'Neill, Tonkovich nor their combination teach that the at least one inlet port is positioned substantially parallel with respect to the same plane as the conducting portion of the heat exchanger. As such, Claim 8 is also allowable for this reason.

Within the Office Action, Claims 41 and 44 are rejected under 35 U.S.C. §103(a) as being unpatentable over any of the prior art reference as applied to Claim 1, and further in view of US Patent No. 5,918,469 to Cardella (hereafter "Cardella") or International Publication WO 01/25711 A1. The Applicant respectfully traverses these rejections. Claims 41 and 44 are

dependent on the independent Claim 1. Since independent Claim 1 is an allowable base claim, Claims 41 and 44 are all also allowable as being dependent upon an allowable base claim.

New dependent claims

By the above amendments, new dependent Claim 129-131 have been added. Claims 129-131 are dependent upon the independent Claim 1. As discussed above, the independent Claim 1 is an allowable base claim. Accordingly, Claims 128-131 are also allowable as being dependent upon an allowable base claim.

The Applicant respectfully requests examination and reconsideration in view of the amendments above and remarks above. Following the above amendments, Claims 1, 8, 10, 12-14, 16, 17, 19, 29-32, 38, 40, 41, 44 and 128-131 are currently pending. Should the Examiner have any questions or comments, the Examiner is encouraged to call the undersigned at (408) 530-9700 to discuss the same so that any outstanding issues can be expeditiously resolved.

Respectfully submitted,
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Dated: July 9, 2009

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